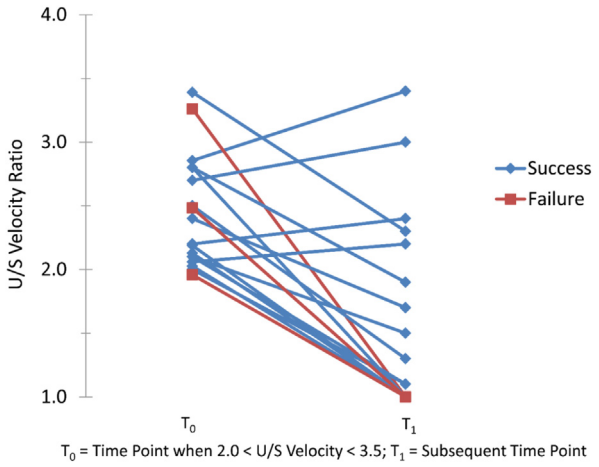

Fig 2. Ultrasound (*U/S*) velocity ratio progression over time.

Table. Relationship of duplex and computed tomography (*CT*) scan findings and graft failure

	Graft status		
	Failed, No. (%)	*Patent, No. (%)*	P *value*
U/S velocity ratio			
<2.0	3 (0.5)	622 (99.5)	<.001[a]
2.0-3.5	3 (12)	22 (88)	
>3.5	4 (67)	2 (33)	
CT stenosis			
0-49%	0 (0)	578 (100)	<.001[a]
50-59%	2 (5)	35 (95)	
60-69%	5 (22)	18 (78)	
70-79%	2 (14)	12 (86)	
>80%	1 (25)	3 (75)	

U/S, Ultrasound.
[a]Fisher's exact test.

Conclusions: Our analysis demonstrates that significantly elevated U/S velocity ratios >3.5 are strongly correlated with graft failure and also that low and even moderate CT stenosis correlate with graft success. We show that a moderately elevated U/S velocity ratio in the 2 to 3.5 range is largely clinically benign, with few of these grafts ultimately failing and that velocity ratios for this group tend to improve with time. This is a step toward defining the relationship between imaging and outcome for vein grafts, an understanding of which will likely contribute to the establishment of the optimal strategy for graft monitoring.

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Outcomes of Infected Abdominal Aortic Endografts: A Multicenter Experience

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Introduction: Limited single-center experiences with the treatment of infected endovascular endografts (I-EVAR) have been reported. We performed a multicenter review of the surgical care of these patients to elucidate short-term and long-term outcomes.

Methods: A retrospective analysis of all EVAR explants from 2000 to 2014 at four institutions was performed. Patients with I-EVAR undergoing surgical treatment were reviewed. Data were obtained detailing preoperative patient demographics, postoperative morbidity and mortality, and long-term follow-up.

Results: Thirty-six patients, 30 male (83%) and six female (17%), with a median age of 69 years (range, 54-80 years), were treated with endovascular graft excision and revascularization for I-EVAR. Average time from initial EVAR to explantation was 589 days (range, 43-2466 days). Preoperative comorbidities include hypertension, 32 (89%); tobacco use, 31 (86%); coronary artery disease, 26 (72%); hyperlipidemia, 25 (69%); peripheral arterial disease, 13 (36%); cerebrovascular disease, 10 (28%); diabetes, 10 (28%); chronic obstructive pulmonary disease, 9 (25%); and chronic kidney disease, 9 (25%). The most common presenting symptoms were leukocytosis in 23 (63%), pain in 21 (58%), and fever in 20 (56%), which were present an average of 22 days prior to explantation. Eight different types of endograft were removed. Three patients (8%) underwent emergency explantation. Thirty-two patients underwent total graft excision (89%), and four patients underwent partial excision (11%). Methods of reconstruction included in situ reconstruction in 25 (69%) and extra-anatomic reconstruction in 11 (31%). Conduits used in reconstruction consisted of Dacron, with or without rifampin treatment, polytetrafluoroethylene, cryopreserved allograft, and superficial femoral vein. Forty-nine organisms grew from operative cultures. Gram-positive organisms were the most common isolate found in 32 (88%), including *Staphylococcus* in 12 (33%), and *Streptococcus* in six (17%). Anaerobic organisms were cultured in 11 patients (31%), gram-negative organisms in 8 (22%), and fungus in 5 (14%). A majority of patients (21 [58%]) were treated with long-term suppressive antibiotic therapy. Early complications included acute renal failure in 12 (33%), respiratory failure requiring tracheostomy in 3 (8%), bleeding in 2 (6%), and sepsis in 2 (6%). Six patients required reexploration due to hematoma, infected hematoma, lymphatic leak, small-bowel perforation, open abdomen at initial operation, and anastomotic bleeding. Perioperative mortality was 8% (3 of 36) and overall mortality was 25% (9 of 36) at a mean follow-up of 402 days (range, 0-2472 days). Type of reconstruction (in situ vs extra-anatomic) or conduit type did not affect perioperative or overall mortality.

Conclusions: I-EVAR is a rare but potentially devastating clinical problem. Although perioperative mortality is acceptable, overall mortality is high. The most common postoperative complication was acute renal failure; therefore, aortic cross-clamp time should be minimized. Although this is the largest series of I-EVAR, further studies will be necessary to understand risk factors and preventive measures.

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The Aorfix AAA Endograft in Highly Angulated Aortic Necks: Performance in the Pythagoras U.S. Clinical Trial

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Introduction: The AORFIX endograft (Lombard Medical) is a highly conformable modular nitinol/polyester device designed for infrarenal or transrenal fixation. PYTHAGORAS is the first clinical trial to evaluate outcomes for EVAR using AORFIX in highly angulated infrarenal aortic necks (≥60°).

Methods: PYTHAGORAS is a prospective nonrandomized clinical trial that enrolled and treated 151 patients with neck angles ≥60° (high-angle) and 67 patients with neck angles <60° (low-angle) in the EVAR group. The primary control group was patients concurrently undergoing open repair (n = 76), and a meta-analysis of 323 patients from U.S. EVAR clinical trials (Society for Vascular Surgery Lifeline) served as the secondary control. We compared the high- and low-angle EVAR groups with the open group in PYTHAGORAS in terms of mortality (30-day and 1-year) and freedom from major adverse events (MAEs) defined by the Society for Vascular Surgery (myocardial infarction, cerebrovascular accident, renal failure, respiratory failure, paralysis/paraparesis, bowel ischemia, death, and bleeding) using the Fisher exact test (Table I). Graft migration and type I and III endoleak were compared between high-angle and low-angle groups (Table II).

Results: Patient demographics and comorbidities were similar between the EVAR and open group with the exception of age (EVAR 76 ± 8 vs open 70 ± 7 years; $P < .05$), congestive heart failure (EVAR 13% vs open 7% $P = .015$), neck angle (EVAR all 71° ± 23° and high angle 83° ± 15° vs open 48° ± 23°; $P < .05$), and female gender (EVAR high angle 35% vs open 17%; $P < .0001$). Sac diameter and other anatomic variables were similar. Operative data favored the EVAR group for procedure duration, blood loss, and hospital length of stay (all $P < .05$). There was no statistically significant difference between freedom from MAEs, 30-day, and 1-year mortality between of low-angle or high-angle EVAR groups compared with the PYTHAGOAS open control group (Table I). Also, there was no difference between low-angle and high-angle patients in regards to sac shrinkage, type I/III endoleak, and endograft migration (Table II).

Conclusions: PYTHAGORAS is the first U.S. clinical trial designed to evaluate the performance of EVAR in a population of patients with neck angles ≥60°. Despite significant predictors of worse short-term and long-term outcomes (female gender, congestive heart failure, neck angle), MAEs and other pertinent outcomes were better or similar to open repair

Table I. Mortality and freedom from major adverse events (*MAEs*) comparison between AORFIX and Pythagoras open control group

Outcome	*Aorfix<60° (n = 67), %*	*Aorfix 60-133° (n = 151), %*	*PYTHAGORAS open, %*	*SVS control group (n = 323), %*	P *value Aorfix vs open control*	
					<60°	*>60°*
Freedom from SVS MAE, 30 days	92.5	81.5	57.9	56.3	<.001	<.001
Mortality						
30 days	1.5	2.0	1.3	2.8	.928	.717
1 year	3.0	7.3	6.6	6.5	.320	.845

SVS, Society for Vascular Surgery.

Table II. Sac shrinkage, endoleaks, and migration comparison between low and high angle abdominal aortic aneurysm treated with AORFIX

Variable	*Aorfix <60°, %*	*Aorfix >60°, %*	P *value*
Outcome at 1 year			
Sac shrinkage (5 mm)	36.7	44.1	.7335
Sac expansion (5 mm)	0	1.8	1.000
Type I/III leak	0	1.9	1.000
Migration (10 mm)	0	1.9	1.000

and similar to trials with less severe anatomy. The results encourage the use of AORFIX in patients with highly angulated neck anatomy who may otherwise have no endovascular option.

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Improved Trends in Patient Survival and Decreased Major Complications After Emergency Ruptured Abdominal Aortic Aneurysm Repair From 2005 to 2011

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Introduction: Emergency abdominal aortic aneurysm (AAA) repair carries a high risk of morbidity and mortality. This study seeks to examine morbidity and mortality trends from the National Surgical Quality Improvement Program (NSQIP) database, and identify potential risk factors.

Table. Patient mortality from 2005 to 2011

Operative year	*No mortality, No. (%)*	*Death ≤24 hours after surgery, No. (%)*	*Death >24 hours after surgery, No. (%)*
2005	38 (70.4)	8 (14.8)	8 (14.8)
2006	127 (65.1)	34 (17.4)	34 (17.4)
2007	260 (71.4)	36 (9.9)	68 (18.7)
2008	343 (68.1)	64 (12.7)	97 (19.2)
2009	359 (71.7)	57 (11.4)	85 (17.0)
2010	402 (73.2)	59 (10.7)	88 (16.0)
2011	452 (76.1)	63 (10.6)	79 (13.3)

Chi-squared test statistic for Pearson's correlation coefficient of trend: $P = .002$.

Methods: All emergency AAA repairs were identified using the NSQIP database from 2005-2011. Univariate analysis (using Student's *t*-test, Chi-squared, and Fisher's exact test) and multivariate logistic regression was performed to examine trends in mortality and morbidity.

Results: Out of 2761 patients who underwent emergency AAA repair, 321 (11.6%) died within 24 hours of surgery. Of the remaining 2440 patients, 1133 (46.4%) had major complications and 459 (18.8%) died during the postoperative period. From 2005 to 2011, there was a significant decrease in patient mortality, particularly in patients who survived the perioperative period ($P = .002$; Fig; Table). Total complications increased overall ($P < .0001$); however, major complications decreased from 58.7% in 2005 to 42.6% in 2011 ($P < .0001$) in the patients who survived beyond 24 hours. The use of endovascular repair increased over the study period ($P < .0001$). On multivariate analysis of patients who survived past the initial 24-hour period, age (odds ratio [OR], 1.050), open repair (OR, 1.8), and presence of a major complication (OR, 3.3) were significantly associated with death ($P < .001$).

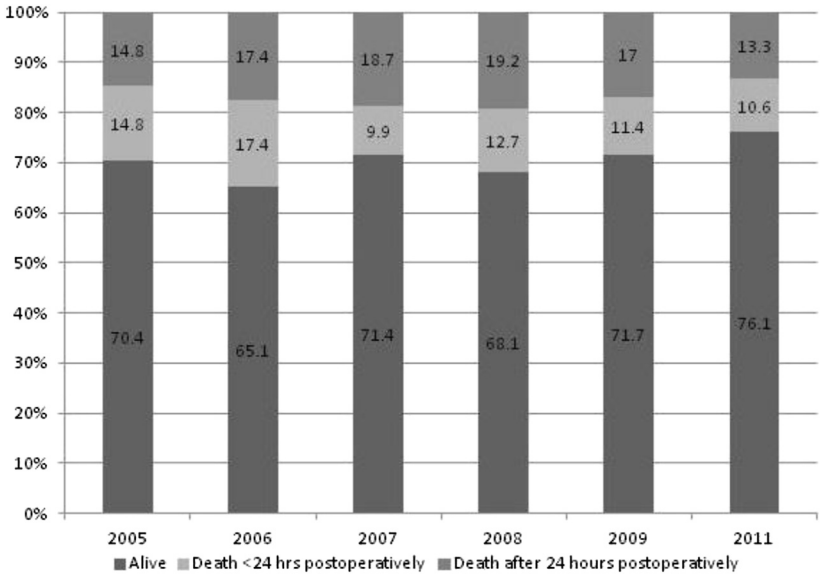

Fig. Patient mortality from 2005 to 2011 (data labels represent percentage mortality).